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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 09/973,401
Filing Date: October 09, 2001
Appellant(s): KARRS ET AL.

MAILED

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GROUP 1700

Adrian T. Calderone
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed April 9, 2007 appealing from the Office action mailed November 1, 2006.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

No amendment after final has been filed.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct. Note, ground of rejection is a 103 not anticipated.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

5,282,355	Yamaguchi	02-1994

5,632,142	Surette	05-1997
2,936,846	Tyler et al.	05-1960
5,043,146	Ishikawa et al.	08-1991
5,397,545	Balling et al.	03-1995
6,534,022	Carlborg et al.	03-2003
5,709,088	Acaster	01-1998
5,476,378	Zagoroff et al.	12-1995
EU 0166480	Carboni	01-1986

Admission in Applicants' Specification at page 9, lines 15-23

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

1. Claims 1-3, 8, 14, and 15 are rejected under 35 U.S.C. 102(b) as being anticipated by European Patent Application 0166480 (EU '480). It is noted that the system is being examined as an apparatus. Regarding claims 1 and 8, EU '480 discloses a system for catalytically treating a gas stream (Figure and page 1), which

comprises: a gas phase reactor containing a catalyst (disks 20) for the treatment of the gas stream containing NOx (page 2, line 1) in at least one catalyst bed having an upstream end and a downstream end; an axial fan (7) positioned upstream of the at least one catalyst bed and having a rotatable impeller (rotor blades as shown in Figure) for moving the gas stream through the gas phase reactor; and, c) gas flow modification means (the flare portion connected after the constricted area as shown in Figure and See below illustrated dwgs.) positioned between the impeller and the gas phase reactor for decreasing gas stream velocity, and increasing gas flow uniformity. EU '480 discloses the gas flow modification means of the claimed invention; therefore, the gas flow modification means of EU '480 inherently decreases the gas stream velocity and increases gas flow uniformity since a *prima facie* case of either anticipation or obviousness has been established when the claimed and the prior art products are identically or substantially identical in structure. See *In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977). Regarding claims 2 and 3, the flow gas modification means of EU '480 inherently provides a gas stream entering the gas phase reactor with a velocity profile exhibiting not more than about 10% or 5% velocity deviation from an average gas stream velocity at the upstream end of the at least one catalyst bed, since the EU '480 discloses the gas flow modification means of the claimed invention; therefore, the velocity profile characteristics must necessarily present in the structure. See *In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977). Regarding claims 14 and 15, EU '480 discloses the fan (7) impeller includes a plurality of blades as shown in Figure 1.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1 and 21-23, 31, 34-35, and 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamaguchi (5,282,355). Regarding claims 1, 21-23, and 31, Yamaguchi discloses a system for catalytically treating a furnace flue gas (Fig. 2), which comprises: a) gas phase reactor containing a catalyst (6) for the treatment of the flue gas in at least one catalyst bed (Col. 1, lines 50-55) having an upstream end and a downstream end for removal of NOx; b) an axial fan (gas turbine 1) positioned upstream of the at least one catalyst bed and downstream of furnace and having a rotatable impeller (inherent feature of a gas turbine) for moving the flue gas from the furnace through the gas phase reactor; and, means for recycling a portion of the flue gas (via component 10) from downstream of the axial fan to a convection section (section 4). Note, the convection section 4 has a front conical transition duct which constitutes the gas flow modification means for decreasing the gas velocity and increasing gas flow uniformity. Note, Yamaguchi '355 discloses the gas flow modification means of the claimed invention; therefore, the gas flow modification means of Yamaguchi '355 inherently possesses velocity characteristics of decreasing the gas stream velocity and increasing gas flow uniformity. Note, a *prima facie* case of either anticipation or

obviousness has been established when the claimed and the prior art products are identically or substantially identical in structure. See *In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977. With respect to the recycling portion of the flue gas to the convection section of the furnace located upstream of the axial fan, it would have been obvious in view of Yamaguchi to one having ordinary skill in the art to recycle a portion of the flue gas upstream of the gas turbine to effectively pressurized and deliver the gas back into the catalytic system for gas treatment and such configuration provides a cost savings by eliminating the need for additional exhaust fan. It is submitted whether recycling a portion of the flue gas downstream of the axial fan to either upstream or downstream of the axial fan does not alter the mechanism of purifying the flue gas stream being the fact that the flue gas stream is mixed and vaporized the reducing agent NOx upstream of the catalyst member (6) [the flue gas stream (via fan 10) is mixed and vaporized the reducing agent (via line 8) prior to reaction taking place in the catalyst member 6 of Yamaguchi '355] as evidenced by Yamaguchi '355. Furthermore, the recitation with respect to recycling a portion of the flue gas upstream of the axial fan is directed to the manner of operating a device which does not differentiate the claimed apparatus from a prior art. See Ex parte Masham, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987). Regarding claims 22 and 23, Yamaguchi shows the exhaust gas and the reducing agent (ammonia) are feed to the recycle manifold (plurality of spray nozzles connected to a common pipe as shown in Fig. 2 in the convection section). Regarding claims 34 and 35, Yamaguchi discloses a gas turbine, which inherently has blade units comprise of blades extending radially outward from the

impeller. Regarding claim 38, Yamaguchi discloses a heat recovery section (5) downstream of the phase reactor.

3. Claims 2-3 are rejected under 35 U.S.C. 103(a) as being unpatentable over EU '480. EU '480 shows convergent section 13 with enlarged section 34, which decreases the gas stream velocity and increasing the gas flow uniformity at most thru routine optimization. It appears EU '480 provide a gas flow modification means with the gas stream entering the gas phase reactor has a velocity profile exhibiting not more than about 10% or 5% velocity deviation from an average gas stream velocity at the upstream end of the at least one catalyst bed, since the EU '480 discloses the gas flow modification means of the claimed invention; therefore, the velocity profile characteristics must necessarily present in the structure. See *In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977).

4. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over EU '480 in view of Surette (5,632,142). Regarding claim 4, EU '480 discloses the axial fan (7) includes a housing (casing 30-31) and a flared portion (convergent section 13 to wall 34) but fails to disclose a tail cone includes a distally pointing tapered end portion. Surette teaches a gas turbine engine 101 with a tail cone (nozzle plug 117) to minimize turbulence and provide a smooth and uniform flow path to the diffuser 115 or downstream duct (Col. 3, lines 21-23 and Col. 3, lines 38-44). Thus, it would have been obvious in view of Surette to one having ordinary skill in the art to modify the turbine

structure of EU '480 with a gas turbine with a tail cone as taught by Surette in order to provide a smooth flow stream downstream of the turbine blades or axial fan blades. Note, Surette also makes it clear the function of the flared portion (diffuser 34) is to reduce the velocity of the exhaust gas (Col. 4, lines 58-67).

5. Claims 5, 50, 51, and 53-55 are rejected under 35 U.S.C. 103(a) as being unpatentable over the applied references (EU '480 in view of Surette '142) as applied to claims 1 and 4 above, and further in view of Tyler et al. (2,936,846) and Ishikawa et al. (5,043,146). The applied references disclose a transition duct (convergent section 13 to wall 34 of EU '480 and bell-shaped wall 119 of Surette '142) which flare outward so as to gradually increase cross-sectional area available to gas stream flow and the circumference of the housing gradually increases from a position of the housing at the axial fan to the outlet of the housing but fail to disclose the transition duct having perforated walls. Tyler '846 teaches a turbine engine (Col. 4, lines 25-30) with a transition duct having perforated walls (perforations 48 in walls of cylindrical section 36) to suppress the noise generated by the turbine engine. Thus, it would have been obvious in view of Tyler '846 to one having ordinary skill in the art to modify the transition duct of the applied references having perforated walls as taught by Tyler '846 in order to reduce the noise generated from the exhaust gas. Alternatively, Ishikawa teaches a flow controller 3 or guide vane unit (Col. 3, lines 30-32) is provided in front of the catalyst layer 4 in the duct portion 1 as shown in Figs. 4-5 and 10-11 to prevent the generation of vortexes in front of the catalyst layer (Col. 5, lines 14-17) and to provide a

uniform exhaust gas flow to the catalyst layer (Col. 1, lines 31-38). Thus, it would have been obvious in view of Ishikawa to one having ordinary skill in the art to modify the transition duct of the applied references having perforated walls as taught by Ishikawa in order to minimize the generation of the vortexes and provide a uniform exhaust gas flow to the catalyst layer.

6. Claims 6 and 56 are rejected under 35 U.S.C. 103(a) as being unpatentable over EU '480 in view of Tyler et al. '846 and Ishikawa et al. '146. EU '480 discloses a transition duct (convergent section 13 to wall 34 of EU '480) which flare outward so as to gradually increase cross-sectional area available to gas stream flow but fails to disclose the transition duct having perforated walls. Tyler '846 discloses a turbine engine (Col. 4, lines 25-30) with a transition duct having perforated walls (perforations 48 in walls of cylindrical section 36) to suppress the noise generated by the turbine engine. Thus, it would have been obvious in view of Tyler '846 to one having ordinary skill in the art to modify the transition duct of EU '480 having perforated walls as taught by Tyler '846 in order to reduce the noise generated from the exhaust gas. Alternatively, Ishikawa teaches a flow controller 3 (Col. 3, lines 30-32) is provided in front of the catalyst layer 4 in the duct portion 1 as shown in Figs. 4-5 and 10-11 to prevent the generation of vortexes in front of the catalyst layer (Col. 5, lines 14-17) and to provide a uniform exhaust gas flow to the catalyst layer (Col. 1, lines 31-38). Thus, it would have been obvious in view of Ishikawa to one having ordinary skill in the art to modify the transition duct of EU '480 having perforated walls as taught by Ishikawa in

order to minimize the generation of the vortexes and provide a uniform exhaust gas flow to the catalyst layer.

7. Claims 7 and 18-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over EU '480 in view of Yamaguchi (5,282,355). Regarding claim 7, EU '480 fails to disclose means for recycling a portion of the gas stream from downstream of the axial fan to a position upstream of the axial fan. Yamaguchi '355 teaches a portion of the NOx –free exhaust gas stream is recirculated back to the a position upstream of the axial fan (best understood by Examiner to be the front back of the catalyst system) to facilitate vaporizing the aqueous ammonia prior to injecting to the catalyst layer of the NOx removal system 6 (Col. 1, lines 31-46). Thus, it would have been obvious in view of Yamaguchi '355 to one having ordinary skill in the art to modify the exhaust treatment system of EU '480 with a recycling exhaust stream as taught by Yamaguchi in order to facilitate vaporizing of the aqueous ammonia to be used in the catalyst system. Regarding claim 18, EU '480 fails to disclose a heat recovery section positioned downstream of the gas phase reactor for cooling the gas stream. Yamaguchi teaches a heat exchanger 5 located both upstream and downstream of the exhaust gas to recover the heat from the exhaust gas to be used in a boiler (Col. 1, lines 21-31). Thus, it would have been obvious in view of Yamaguchi to one having ordinary skill in the art to modify the exhaust treatment system of EU '480 with a heat recovery section as taught by Yamaguchi in order to recover the heat from exhaust gas. Regarding claim 19, EU '480 fails to disclose means for introducing reducing agent into the gas stream.

Yamaguchi teaches a reducing agent (ammonia) is introduced by via nozzle 10a (Fig. 3) to facilitate in reducing the NOx in the exhaust gas (Col. 1, lines 50-55). Thus, it would have been obvious in view of Yamaguchi to one having ordinary skill in the art to modify the exhaust treatment system of EU '480 with means for introducing reducing agent in to the gas stream as taught by Yamaguchi in order to facilitate the conversion of NOx to nitrogen. Regarding claim 20, EU '480 fails to disclose a gas stream recycle manifold [spray nozzles connected to common pipe (via line 10)] for communicating a portion of the gas stream downstream of the axial fan to a convection section of a furnace positioned upstream of the axial fan, wherein the means for introducing reducing agent comprises an inlet for introducing the reducing agent into the gas stream recycle manifold. Yamaguchi discloses a gas-recycling stream (via fan 10) downstream of a gas turbine 1 to facilitate vaporizing the ammonia and means for introducing reducing agent (via nozzle 10a) to facilitate in reducing the NOx (Col. 1, lines 50-55). Thus, it would have been obvious in view of Yamaguchi to one having ordinary skill in the art to modify the gas treatment system of EU '480 with a gas recycling stream and means for introducing the reducing agent as taught by Yamaguchi in order to facilitate vaporizing the ammonia and reducing the NOx.

8. Claims 9-10 and 12-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over EU '480 in view of Balling et al. (5,397,545). EU '480 discloses the catalyst elements 20 but fails to disclose the catalyst bed includes a plurality of stackable, individually separable modules containing one or more materials selected

from the group consisting of vanadium oxide, aluminum oxide, titanium oxide, tungsten oxide, molybdenum oxide and zeolite. Balling '545 teaches a plurality of stacked honeycomb catalytic converters (8,10,12,14,16) (Col. 4, lines 65-68) made of vanadium pentoxide, molybdenum oxide, and etc. (Col. 5, lines 1-6) to facilitate the conversion of nitrogen oxide to nitrogen and carbon dioxide (Col. 6, lines 18-24). Thus, it would have been obvious in view of Balling to one having ordinary skill in the art to modify the catalyst elements of EU '480 with a honeycomb catalyst converters as taught by Balling to facilitate the conversion of NOx to nitrogen.

9. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over EU '480 in view of Carlborg et al. (6,534,022). EU '480 discloses catalyst elements 20 but fails to disclose the catalyst bed comprises a catalyst supported on a mesh-like structure having a void space of at least about 85%. Carlborg teaches the catalyst is supported on a mesh-like structure with a porosity greater than 85% (Col. 2, lines 1-7), which provides the benefits of superior heat transfer, low thermal mass, and improved catalyst effectiveness (Col. 8, lines 35-39). Thus, it would have been obvious in view of Carlborg to one having ordinary skill in the art to modify the catalyst elements of EU '480 with a catalyst of a mesh-like structure as taught by Carlborg in order to gain the above benefits.

10. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over EU '480 in view of prior art Admission and. EU '480 discloses fan blades but fails to disclose

blade units have a variable pitch. Admission discloses it is conventional to use blade units with variable pitch to control the flue gas velocity (specification page 9, lines 15-23). Thus, it would have been obvious in view of Admission to one having ordinary skill in the art to modify the fan blade of EU '480 with the blades having variable pitch in order to control the flue gas velocity.

11. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over EU '480 in view of Acaster (5,709,088). EU '480 shows a fan having impeller but fails to disclose the impeller has a variable speed of rotation which is adjustable while the impeller is rotating. Acaster teaches an engine turbine (Fig. 1) having an impeller with variable speed of rotation depending on the demand of the exhaust gas quantity and pressure. Thus, it would have been obvious in view of Acaster to one having ordinary skill in the art to modify the fan of EU '480 with impeller has a variable speed of rotation as taught by Acaster in order to keep up with the demand of the exhaust gas and pressure. Note, it is conventional to provide impeller with gear reduction or variable drive ratio and it would have been obvious to do so here control the exhaust gas flow rate.

12. Claims 21-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over EU '480 in view of Yamaguchi (5,282,355). Regarding claims 21-23, EU '480 discloses a system for catalytically treating a gas stream (Fig. 1 and page 1), which comprises: a gas phase reactor containing a catalyst (disks 20) for the treatment of the gas stream containing NOx (page 2, line 1) in at least one catalyst bed having an upstream end and

a downstream end; an axial fan (7) positioned upstream of the at least one catalyst bed and having a rotatable impeller (rotor blades as shown in Fig. 1) for moving the gas stream through the gas phase reactor. EU '480 discloses the claimed invention except fails to disclose means for recycling a portion of the gas stream from downstream of the axial fan to a position upstream of the axial fan and means for introducing the reducing agent into the recycle manifold. Yamaguchi discloses a gas-recycling stream (via fan 10, Figure 2) downstream of a gas turbine 1 to facilitate vaporizing the ammonia and means for introducing reducing agent (via nozzle 10a) to the convection (4) facilitate in reducing the NOx (Col. 1, lines 50-55). The recitation of " recycling a portion of the flue gas stream downstream of the axial fan to the upstream of the axial fan is directed to the manner of operating a device, intended use, and rearrangement of parts. See In re Otto, 312 F.2d 937, 938, 136 USPQ 458, 459 (CCPA 1963) and See *Ex parte Masham*, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987) and *In re Japiske,* 181 F.2d 1019, 86 USPQ 70 (CCPA 1950). It is submitted whether recycling a portion of the flue gas downstream of the axial fan to either upstream or downstream of the axial fan does not alter the mechanism of purifying the flue gas stream being the fact that the flue gas stream is mixed and vaporized the reducing agent NOx upstream of the catalyst member (6) [the flue gas stream (via fan 10) is mixed and vaporized the reducing agent (via line 8) prior to reaction taking place in the catalyst member 6 of Yamaguchi '355] as evidenced by Yamaguchi '355. Thus, it would have been obvious in view of Yamaguchi to one having ordinary skill in the art to modify the gas treatment system of EU '480 with a gas recycling stream and means for introducing the reducing agent as taught by

Yamaguchi in order to facilitate vaporizing the ammonia and reducing the NOx. Regarding claim 24, it is conventional to provide control valve in a recycled gas stream and it would have been obvious to do so here to regulate the amount of gas flow rate recycled back into the convection section.

13. Claims 25 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over the applied references (EU '480 in view of Yamaguchi '355) as applied to claim 22 above, and further in view of Tyler et al. (2,936,846) and Ishikawa et al. (5,043,146). The applied references disclose a transition duct (convergent section 13 to wall 34 of EU '480) which flare outward so as to gradually increase cross-sectional area available to gas stream flow but fails to disclose the transition duct having perforated walls. Tyler '846 discloses a turbine engine (Col. 4, lines 25-30) with a transition duct having perforated walls (perforations 48 in walls of cylindrical section 36) to suppress the noise generated by the turbine engine. Thus, it would have been obvious in view of Tyler '846 to one having ordinary skill in the art to modify the transition duct of the applied references with perforated walls as taught by Tyler '846 in order to reduce the noise generated from the exhaust gas. Alternatively, Ishikawa teaches a flow controller 3 (Col. 3, lines 30-32) is provided in front of the catalyst layer 4 in the duct portion 1 as shown in Figs. 4-5 and 10-11 to prevent the generation of vortexes in front of the catalyst layer (Col. 5, lines 14-17) and to provide a uniform exhaust gas flow to the catalyst layer (Col. 1, lines 31-38). Thus, it would have been obvious in view of Ishikawa to one having ordinary skill in the art to modify the transition duct of the applied

references with perforated walls as taught by Ishikawa in order to minimize the generation of the vortexes and provide a uniform exhaust gas flow to the catalyst layer. Regarding claim 26, Yamaguchi shows on Fig. 2 the gas stream recycle manifold has at least one inlet connected to the transition duct, and at least one outlet connected to the convection section of the furnace.

14. Claims 25 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamaguchi '355 in view of Tyler et al. (2,936,846) and Ishikawa et al. (5,043,146). Yamaguchi '355 discloses a transition duct (4) which flare outward so as to gradually increase cross-sectional area available to gas stream flow but fails to disclose the transition duct having perforated walls. Tyler '846 teaches a turbine engine (Col. 4, lines 25-30) with a transition duct having perforated walls (perforations 48 in walls of cylindrical section 36) to suppress the noise generated by the turbine engine. Thus, it would have been obvious in view of Tyler '846 to one having ordinary skill in the art to modify the transition duct of Yamaguchi having perforated walls as taught by Tyler '846 in order to reduce the noise generated from the exhaust gas. Alternatively, Ishikawa teaches a flow controller 3 (Col. 3, lines 30-32) is provided in front of the catalyst layer 4 in the duct portion 1 as shown in Figs. 4-5 and 10-11 to prevent the generation of vortexes in front of the catalyst layer (Col. 5, lines 14-17) and to provide a uniform exhaust gas flow to the catalyst layer (Col. 1, lines 31-38). Thus, it would have been obvious in view of Ishikawa to one having ordinary skill in the art to modify the transition duct of Yamaguchi having perforated walls as taught by Ishikawa in order to minimize

the generation of the vortexes and provide a uniform exhaust gas flow to the catalyst layer. Regarding claim 26, Yamaguchi shows on Fig. 2 the gas stream recycle manifold has at least one inlet connected to the transition duct, and at least one outlet connected to the convection section of the furnace.

15. Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamaguchi '355 in view of Surette '142. Yamaguchi disclose a turbine 1 (inherently has an axial fan) and the housing having a flared portion (conical section 4) but fails to show a tail cone includes a distally pointing tapered end portion. Surette teaches a gas turbine engine 101 with a tail cone (nozzle plug 117) to minimize turbulence and provide a smooth and uniform flow path to the diffuser 115 or downstream duct (Col. 3, lines 21-23 and Col. 3, lines 38-44). Thus, it would have been obvious in view of Surette to one having ordinary skill in the art to modify gas turbine of Yamaguchi '355 with a gas turbine with a tail cone as taught by Surette in order to provide a smooth flow stream downstream of the turbine blades or axial fan blades. Note, Surette also makes it clear the function of the flared portion (diffuser 34) is to reduce the velocity of the exhaust gas (Col. 4, lines 58-67).

16. Claim 30 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamaguchi '355 in view of Carlborg et al. (6,534,022). Yamaguchi '355 discloses catalyst elements 20 but fails to disclose the catalyst bed comprises a catalyst supported on a mesh-like structure having a void space of at least about 85%. Carlborg

teaches the catalyst is supported on a mesh-like structure with a porosity greater than 85% (Col. 2, lines 1-7), which provides the benefits of superior heat transfer, low thermal mass, and improved catalyst effectiveness (Col. 8, lines 35-39). Thus, it would have been obvious in view of Carlborg to one having ordinary skill in the art to modify the catalyst elements of EU '480 with a catalyst of a mesh-like structure as taught by Carlborg in order to gain the above benefits.

17. Claims 28-29 and 32-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over the Yamaguchi '355 in view of Balling et al. (5,397,545). Yamaguchi '355 the catalyst system 6 but fails to disclose the catalyst bed includes a plurality of stackable, individually separable modules containing one or more materials selected from the group consisting of vanadium oxide, aluminum oxide, titanium oxide, tungsten oxide, molybdenum oxide and zeolite. Balling '545 teaches a plurality of stacked honeycomb catalytic converters (8,10,12,14,16) (Col. 4, lines 65-68) made of vanadium pentoxide, molybdenum oxide, and etc. (Col. 5, lines 1-6) to facilitate the conversion of nitrogen oxide to nitrogen and carbon dioxide (Col. 6, lines 18-24). Thus, it would have been obvious in view of Balling to one having ordinary skill in the art to modify the catalyst system of Yamaguchi '355 with a honeycomb catalyst converters as taught by Balling to facilitate the conversion of NOx to nitrogen.

18. Claim 36 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamaguchi '355 in view of prior art Admission. Yamaguchi discloses the gas turbine

with fan blades but fails to disclose blade units have a variable pitch. Admission discloses it is conventional to use blade units with variable pitch to control the flue gas velocity (specification page 9, lines 15-23). Thus, it would have been obvious in view of Admission to one having ordinary skill in the art to modify the gas turbine of Yamaguchi '355 with the blades having variable pitch in order to control the flue gas velocity.

19. Claim 37 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamaguchi '355 in view of Acaster (5,709,088). Yamaguchi disclose a gas turbine with fan blades fails to disclose the impeller has a variable speed of rotation which is adjustable while the impeller is rotating. Acaster teaches an engine turbine (Fig. 1) having an impeller with variable speed of rotation depending on the demand of the exhaust gas quantity and pressure. Thus, it would have been obvious in view of Acaster to one having ordinary skill in the art to modify the gas turbine of Yamaguchi '355 with impeller has a variable speed of rotation as taught by Acaster in order to keep up with the demand of the exhaust gas and pressure. Note, it is conventional to provide impeller with gear reduction having variable drive ratio and it would have been obvious to do so here control the exhaust gas flow rate.

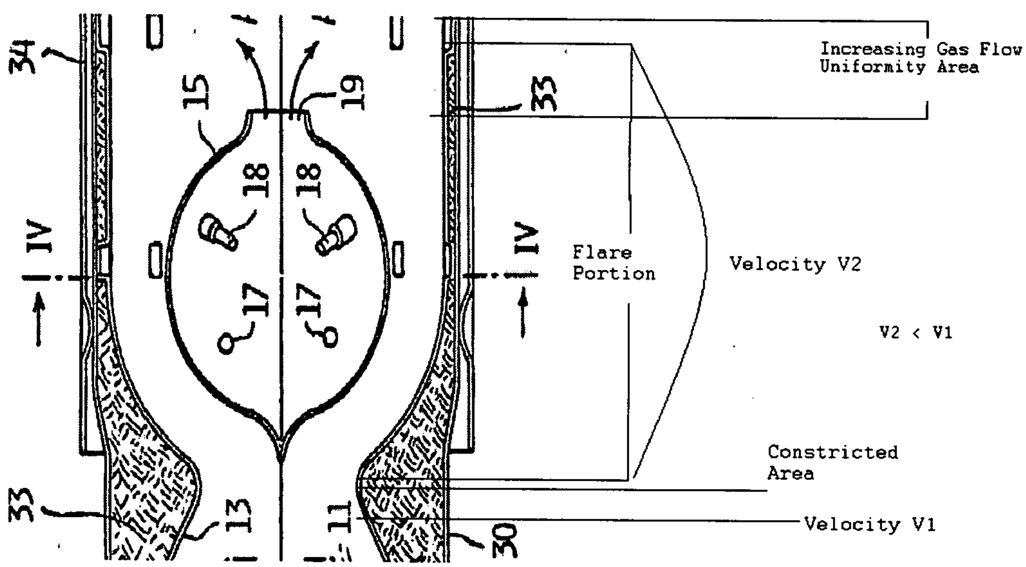
20. Claim 52 is rejected under 35 U.S.C. 103(a) as being unpatentable over the applied references (EU '480 in view of Surette '142 and Tyler et al. '846 and Ishikawa et al. '146) as applied to claims 1 and 4 above, and further in view of Zagoroff et al. (5,476,378). The applied references above fail to disclose the struts positioned in an

annular space between the tail cone and the interior surface of the housing. Zagoroff teaches it is conventional to provide a shaft support struts 39 (Fig. 4) to facilitate distributing the air to the turbine blades. Thus, it would have been obvious in view of the applied references to provide struts between the tail cone and the housing to facilitate distributing the air to the system.

21. Claim 57 is rejected under 35 U.S.C. 103(a) as being unpatentable over the applied references (EU '480 in view of Surette '142) as applied to claim 27 above, and further in view of Tyler et al. (2,936,846) and Ishikawa et al. (5,043,146). The applied references disclose a transition duct (convergent section 13 to wall 34 of EU '480 and bell-shaped wall 119 of Surette '142) which flare outward so as to gradually increase cross-sectional area available to gas stream flow and the circumference of the housing gradually increases from a position of the housing at the axial fan to the outlet of the housing but fail to disclose the transition duct having perforated walls. Tyler '846 teaches a turbine engine (Col. 4, lines 25-30) with a transition duct having perforated walls (perforations 48 in walls of cylindrical section 36) to suppress the noise generated by the turbine engine. Thus, it would have been obvious in view of Tyler '846 to one having ordinary skill in the art to modify the transition duct of the applied references having perforated walls as taught by Tyler '846 in order to reduce the noise generated from the exhaust gas. The applied references fail to disclose a guide vane unit disposed at the inlet of the transition duct. Ishikawa teaches a flow controller 3 (rectifier) or guide vane (Col. 3, lines 30-32) is provided in front of the catalyst layer 4 in

the duct portion 1 as shown in Figs. 4-5 and 10-11 to prevent the generation of vortexes in front of the catalyst layer (Col. 5, lines 14-17) and to provide a uniform exhaust gas flow to the catalyst layer (Col. 1, lines 31-38). Thus, it would have been obvious in view of Ishikawa to one having ordinary skill in the art to modify the transition duct of the applied references with guide vane unit as taught by Ishikawa in order to minimize the generation of the vortexes and provide a uniform exhaust gas flow to the catalyst layer.

<u>Illustrated drawings</u>



EU '480 Reference

(10) Response to Argument

Applicants' arguments filed in the appeal brief filed on April 9, 2007 have been fully considered but they are not persuasive.

1) Applicants argue on page 16 that the "that element 34 is a "gas flow modification system," it is merely an exterior wall that surrounds the *outside of the casing* (30, 31). See Exhibit A, p. 6. According to the specification of EU 480, wall member 34 is positioned a certain distance away to guide air to sweep the casing and cool it effectively, *Id.* Accordingly, it merely acts to improve the aerodynamic properties of the *outside of the muffler* so that *outside air* can flow efficiently over it and effectively dissipate heat. It is not an active system that actually modifies the flow of the exhaust gases. Indeed, the '480 application utilizes the term "exhaust gases" to describe the NOx containing gases located in the muffler, as opposed to the term "air" which he uses to describe atmosphere outside the system. Clearly the use of different terms denotes different gases. Accordingly, the casing (34) that the Examiner contends "modifies the gas flow" does not actually modify the flow of the exhaust gas at all. Further, because it is located externally to the outside casing, it *cannot* act on the exhaust gases contained therein. That is, the inner chamber of the '480 patent is a partially closed system in that the only access to outside air is through suction through the intake guides. " Such contention is not persuasive as EU '480 discloses a flare portion connected after the constricted area as shown in Figure (See below illustrated dwgs.). <u>The flare portion of EU '480 is the contour of the inside insulation material 33 immediately after the constricted area 13 where the gas flow decreases velocity when exiting the constricted area 33 to the flare portion and increasing gas flow uniformity in the flattened section 33 of the flare portion</u> thus, the flare portion is <u>equivalent</u> to the gas flow modification <u>section 200</u>.

2) Applicants argue on page 17 that "Because these portions narrow the opening into the combustion chamber, one of ordinary skill in the art recognizes that the velocity of any gas propelled therethrough is actually *increased.* Element (c) of Claim 1 of the instant application, however, requires that the gas flow modification means acts to *decrease* the gas velocity." Such contention is not persuasive as EU '480 shows the gas flow from the constricted area 13 thru the flare portion actually decreases the gas velocity (Figure).

3) Applicants argue on page 18 that EU '480 fails to disclose the means-plus-function as recited in claim 1 "gas flow modification means positioned between the impeller and the gas phase reactor for decreasing gas stream velocity, and increasing gas flow uniformity". Applicants' specification on page 12, lines 6-20, discloses " In order to achieve more even flow of flue gas the fan system 100 includes a gas flow modification section 200 for decreasing the flue gas velocity and flattening the velocity profile of the gas. The gas flow modification section 200 includes a generally cylindrical, longitudinally extending tail cone 140 having a distally pointing tapered end portion 141 with a generally conical shape. The tail cone 140 is supported by longitudinally oriented planar struts 145 positioned in the annular space between the tail cone 140 and the interior surface of the housing 110. The planar struts 145 not only help support the tail cone 140 but also act as baffles to reduce the gas flow swirl and redirect the spinning component of the gas velocity towards axial flow of the flue gas through the system".

Such contention is not persuasive. EU '480 discloses a "flare portion" connected after the constricted area as shown in Figure (See below illustrated dwgs.) and the "flare portion" of EU '480 is the contour of the inside insulation material 33 immediately after

the constricted area 13. The flare portion is positioned between the impeller (11) and the gas phase reactor (20) and the "flare portion" is structurally equivalent to the "gas flow modification means" section 200 of the claimed invention and the "flare portion" inherently provides the function of decreasing gas velocity when exiting the constricted area 33 of the flare portion and increasing gas flow uniformity in the flattened section 33 of the flare portion, thus; the flare portion is equivalent to the gas flow modification section 200.

4) Applicants argue on page 19 that "EU '480 does not perform the function specified by element (c) of Claim 1. Referring now to Appellants' specification, pages 12-14, the gas flow modification means includes a generally cylindrical longitudinally extending tail cone 140 having a distally pointing tapered end portion 141 with a generally conical shape. (Specification, page 12, lines 9-13, Fig. 2). Moreover, the housing has a distal end section 111 which flares outward in diameter such that the exit diameter of the housing is greater than the diameter at the impeller. The combined reduction of the diameter of the tail cone at tapered end 141 and increasing diameter of the housing at flared section 111 forms an annular diffuser which increases the cross sectional area available for gas flow. This reduces the velocity of the gas and tends to flatten the velocity profile of the gas. (Specification, page 12, line 21 to page 13, line 9)." Such argument is not commensurate with the scope of claim 1. Claim 1 recited the "...gas flow modification means positioned between the impeller and the gas phase reactor for decreasing gas stream velocity, and increasing gas flow uniformity".

Applicants rely on such features which are not recited in the rejected claim 1. Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). However, it is noted that claim 4 further recites the "the axial fan includes a housing and a tail cone, and the gas flow modification means includes a distally pointing tapered end portion of the tail cone and a flared portion of the housing having a gradually increasing diameter." The combination of EU '480 and Surrette '142 disclose such features (Office Action paragraph 4). Particularly, EU '480 discloses the axial fan (7) includes a housing (casing 30-31) and a "flared portion" (convergent section 13 to wall 34) but fails to disclose a tail cone includes a distally pointing tapered end portion. Surette teaches a gas turbine engine 101 with a tail cone (nozzle plug 117) to minimize turbulence and provide a smooth and uniform flow path to the diffuser 115 or downstream duct (Col. 3, lines 21-23 and Col. 3, lines 38-44). Thus, it would have been obvious in view of Surette to one having ordinary skill in the art to modify the turbine structure of EU '480 with a gas turbine with a tail cone as taught by Surette in order to provide a smooth flow stream downstream of the turbine blades or axial fan blades. Note, Surette also makes it clear the <u>function</u> of the flared portion (diffuser 34) is to reduce the velocity of the exhaust gas (Col. 4, lines 58-67).

5) Applicants argue on page 21 that "EU '480 "...the structures of the present invention and EU '480 are not "identical nor substantially identical." For example, the present invention utilizes outwardly flaring walls to decrease the gas flow velocity. EU '480, on the other hand, utilizes a downstream tapered conical section which effectively increases the gas flow

velocity". Applicant admits that the flare portion (inner walls after immediately after the constricted area 13 of EU '480) is the same as the flaring walls of the present invention and providing the same function of decreasing the gas flow velocity. It is submitted that EU '480 shows the gas flow velocity actually decreases further downstream or beyond the burner 15.

6) Applicants argue on page 24 that " In contrast, the present application utilizes a series of motorized fans, flow control devices, and perforated walls to carefully control reaction conditions of NOx containing gases created from a complex industrial process. The concentration and volume of waste gases in the complex petrochemical complex are not equivalent to the exhaust gas profile of an automobile. Consequently, there is no evidence that the exhaust gases are similar. Indeed, the widely disparate technologies suggest greatly differing gas components, concentrations, and volumes.

In short, controlling the flow from an automobile's exhaust and controlling the flow from a large-scale industrial process are very different. Since the processes are so disparate, there is no evidence that even if EU '480 disclosed a gas flow modification means, it would exhibit a similar gas flow velocity reduction profile, especially if applied to a large scale industrial process. At best, EU '480 *could possibly* disclose such a feature (though technically highly improbable in light of EU '480's combustion chamber (15)), but there is no evidence that EU '480 *necessarily* discloses such a feature as required by the MPEP. " Such contention is not persuasive as EU '480 discloses the same structural features of the claimed invention; thus, the device of EU '480 inherently capable of performing the intended function and/or process.

7) Applicants argue on pages 27-28 and pages 67 that "Examiner failed to perform any of the analysis required by the MPEP in establishing equivalency of a <u>means-plus-function</u> element" and the "transition duct". Particularly, Applicants argue that Yamaguchi's reference fails to disclose a gas flow modification means that decreases velocity and increases gas flow uniformity as required by claim 1. It is submitted that Yamaguchi's reference discloses the conical section 4 contains a frontal transition duct and a flare portion connected to the frontal transition duct. Such structure is <u>equivalent</u> to the gas flow modification means as recited in claim 1. With respect to the <u>means-plus-function</u>, it is submitted that Yamaguchi discloses the gas flow enters a frontal transition duct (smaller duct portion) then the gas flow exits the frontal transition duct to a much larger duct or flare portion of the conical section 4. The configuration of the conical section 4 provides a means for decreasing the gas velocity upon leaving the frontal transition duct to a much larger duct or flare portion and increases flow uniformity at least upstream of the heat exchanger 5 and such structure is <u>equivalent</u> to Applicants gas flow modification "means for decreasing stream velocity, and increasing gas flow uniformity."

8) Applicants argue on page 29 that EU '480 does not disclose element (b) "an axial fan positioned upstream of the at least one catalyst bed and having a rotatable impeller <u>for moving the gas stream through the gas phase reactor</u>." Applicants specification on page 8, lines 8-11 discloses a "drive unit 120 includes a drive motor 121 (FIG. I) enclosed within a motor housing 122 (FIG. 2), and a rotatable axial shaft 125 for transmitting rotary motion to an impeller assembly 130. Note, there is <u>no explicit</u>

statement in the specification indicating the structure of "a rotatable impeller" correspond to the claimed function "for moving the gas stream through the gas phase reactor."

In any event, EU '480 discloses a suction fan (7) positioned upstream of at least one catalyst bed (20) and the suction fan (7) has blades (11), which is equivalent to the "rotatable impeller" of instant claim 1 and the suction action (translation pages 3, lines 16-24) of the suction fan (7) drives the impeller which moves the gas stream through the gas phase reactor.

9) Applicants argue on pages 30-32, 59-61, and several other places of the Appeal Brief that EU '480 fails to disclose the means-plus-function of "means for recycling a portion of the flue gas from downstream of the axial fan to a convection of the furnace located upstream of the axial fan". Applicants' specification discloses on page 15, lines 1-20 "Recycle manifold 330 includes one or more pipe branches 331 extending from the side wall 304 of housing 301 for drawing flue gas from the proximal portion 303 of the chamber. The pipe branches 331 connect to a pipe main 332. Ammonia, or other reducing agent, is injected into the pipe main 332 at inlet 338. The recycled flue gas is directed through horizontal distributor pipe 334 and return pipes 335. The return pipes 335 are laterally spaced apart and provide a return flow of recycled flue gas into **multiple regions** of the convection section 20. A valve 333 is a means for controlling the recycling of flue gas and thereby provides spill back control for the system l0. The recycling of the flue gas helps to reduce fluctuations in the ammonia

content of the flue gas entering the catalyst bed by more thoroughly distributing the ammonia. The fluctuation of the ammonia content of the gas is no more than about 10% deviation from the average ammonia content, preferably no more than 5% deviation, and more preferably no more than 3% deviation from the average value of the ammonia content."

Note, Figure 1 in the Applicant specification shows the recycled flue gas is directed through horizontal distributor pipe 334 which has three return pipes 335 and the three return pipes 335 has at least one return pipe connected upstream of the axial fan and therefore, the recycled flue gas is directed both upstream and downstream of the axial fan or **multiple regions** of the convection section 20. It is submitted that there is no disclosure of criticality of providing a means for recycling a portion of the flue gas downstream of the axial fan to a convection section of the furnace located upstream of the axial fan or vice-versa.

In any event, Yamaguchi shows a fan (10) which has a means for recycling a portion of the flue gas downstream of axial fan (10) and recycling a portion of the flue gas downstream of the axial fan has the same function or equivalent means of distributing the gas ammonia gas as recycling a portion of the flue gas upstream of the axial fan as claimed. It appears the mere difference between the configuration of the claimed invention and the Yamaguchi's reference is an obvious matter of design choice of rearrangement of parts in view of absence of unexpected results. In addition, recycling a portion of the flue gas upstream of the axial fan as claimed would eliminate the need of an additional fan or auxiliary fan, and such configuration provides a cost

savings. Thus, it would have been obvious in view of Yamaguchi to one having ordinary skill in the art to recycle a portion of the flue gas upstream of the gas turbine to effectively pressurized and deliver the gas back into the catalytic system for gas treatment and such configuration provides a cost savings by eliminating the need for additional exhaust fan.

10) Applicants argue on page 33 that " The exhaust gases are comprised of gases that are not flammable or appropriate for combustion in a gas turbine. For example, the exhaust gases are primarily comprised of carbon monoxide, water and NOx gases, along with other impurities. As such, any gas located downstream of the gas turbine and pumped upstream through the gas turbine, as required by element (c) of Claim 21 would result in shutting down or severely damaging the gas turbine. In other words, pumping in these gases would actually prohibit the proper operation of the gas turbine and effectively disable the system disclosed in Yamaguchi." Such argument is not persuasive. It is not clear how recycling a portion of the flue gas as disclosed by Yamaguchi would severely damage the gas turbine because the "recycled" flue gas of Yamaguchi is upstream of the gas turbine. In fact, recycling a portion of the flue gas upstream of the axial fan or gas turbine as claimed will actually damage and reduce the lifetime of the axial fan or turbine being the flue gas comprises gases such as NOx and SOx, which are highly corrosive gases.

11) The argument on pages 38 and 69 with respect to the teachings of Surrette has been addressed in paragraph 4 of the final office action.

12) Applicants argue on pages 47 and 63-65 that the combination of EU '480, Tyler and Ishikawa fails to disclose the outwardly flaring walls. Both Tyler and Ishikawa discloses the perforated walls and the mere changing the shape of the perforated walls which "flare outward" is within the level of ordinary skill in the art. See *In re Dailey.*

13) Applicants argue on pages 53 and 72 that there is no motivation to combine the teaching of Balling with EU '480. Such contention is not persuasive as since it is desirable to provide a plurality of stackable catalyst modules as taught by Balling in the device of EU'480 to increase the conversion of NOx versus a single module as shown by EU '480 (Figure).

14) Applicants argue on page 57 that the Acaster reference is non-analagous art. Such contention is not persuasive as it has been held that a prior art reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the applicant was concerned, in order to be relied upon as a basis for rejection of the claimed invention. See *In re Oetiker*, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992). In this case, it is pertinent to use a variable speed impeller versus a single speed impeller to control the flow rate of the exhaust gas and the operating pressure of the gas phase reactor.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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